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MORROW MOUNTAIN STATE PARK AQUATIC INVENTORY

by
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edited by
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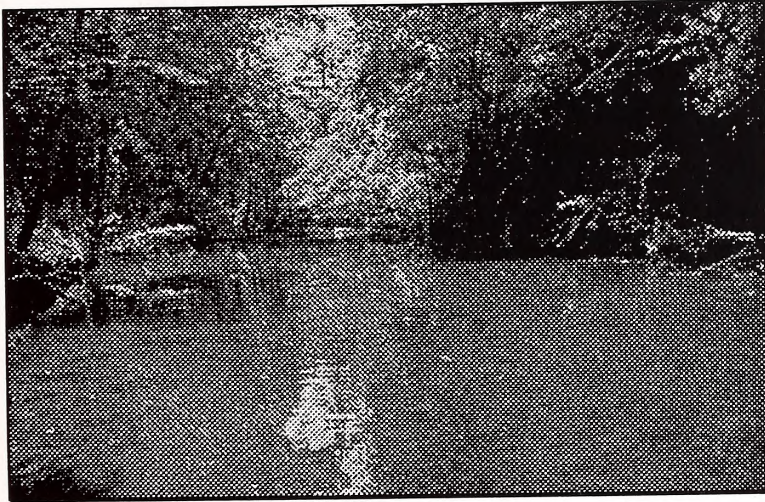
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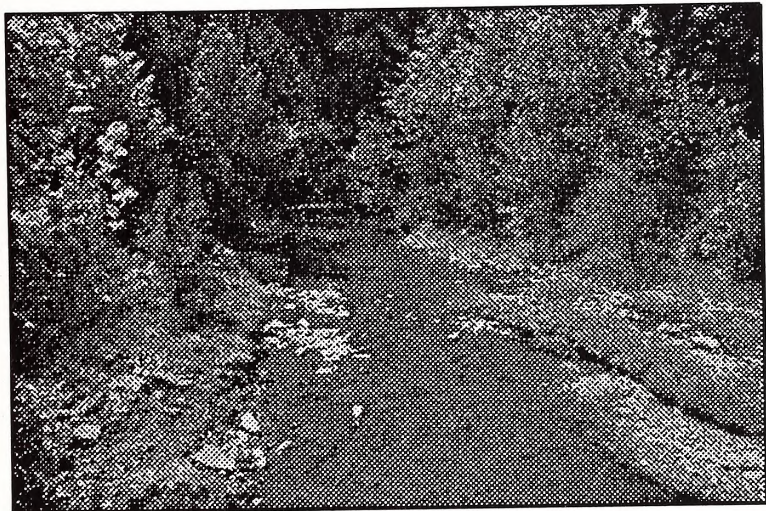
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MORROW MOUNTAIN STATE PARK AQUATIC INVENTORY



Mountain Creek



Little Mountain Creek

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Introduction

Morrow Mountain State Park is located in Stanly County and encompasses 4,693 acres. The park is located in the ancient Uwharrie Mountains. There are four major peaks within the park: Morrow, Fall, Hattaway, and Sugarloaf, with Morrow Mountain being the highest at an elevation of 936 feet.

Through the efforts of a local committee, which was interested in establishing a state park in the area, development of Morrow Mountain State Park began in the 1930s. The park was opened in the summer of 1939, at which time more than 3,000 acres had been acquired through donations by local citizens. Additional facilities were added, and with state funds, more land was acquired to bring the park to the size it is today.

The purpose of this project was to survey for aquatic species, including crayfish, fish, snails, mussels, and sphaeriid clams. Our inventory included the Mountain Creek Subbasin and unnamed tributaries to the Pee Dee River within Morrow Mountain State Park. Figure 1 details the localities of all stations surveyed. The following sections provide information on the species in the above taxa documented at each site in the survey area.

Acknowledgments

The completion of this project would not have been possible without the invaluable assistance of the following people: John M. Alderman, Alvin Braswell, Mike B. Carraway, Alan R. Clark, John E. Cooper, Mark A. Hartman, Tom Henson, Judith A. Johnson, Sheila D. Kirk, Ken Knight, Gerald L. Mackie, Andrew H. McDaniel, Jr., Chris McGrath, Lawrence M. Page, William M. Palmer, Louis P. Polletta, Danny Smith, Wayne Starnes, Ken R. Taylor, Fred G. Thompson, Randall C. Wilson, and Melissa R. Wood. We also thank the state park staff and the landowners who allowed us to work on their properties.

Gabriela B. Mottes

MORROW MOUNTAIN STATE PARK STATIONS INVENTORIED

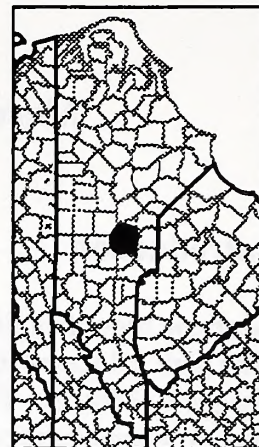
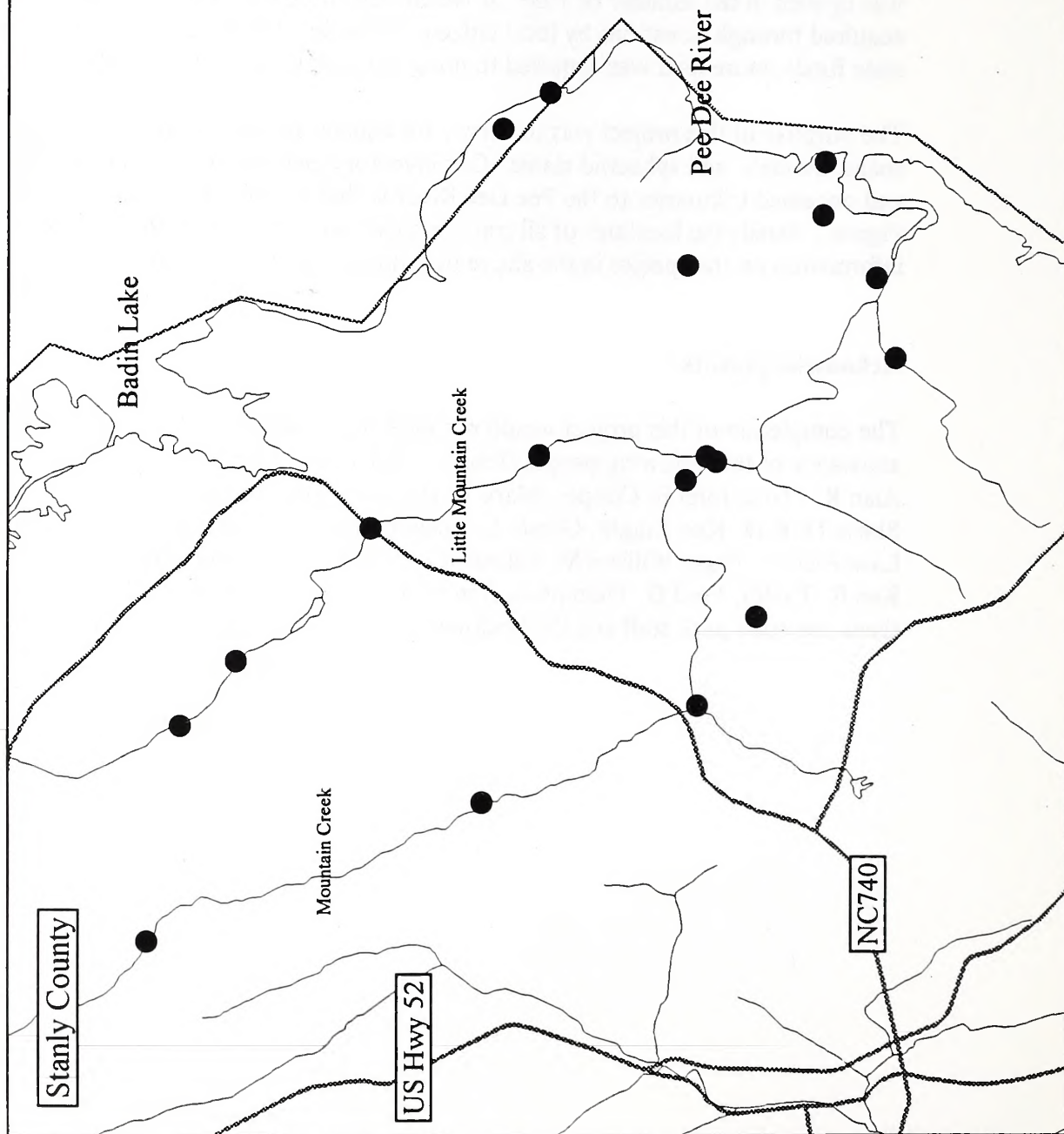


Figure 1.

Aquatic Snails

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NC Wildlife Resources Commission

Introduction

There are approximately 500 species of aquatic snails currently recognized in North America. These 500 species are divided into 78 genera and 15 families (Burch 1989). In North Carolina, there are approximately 52 species representing 8 families (Adams 1990).

Snails are grouped into one of two subclasses. Prosobranch snails are gill-breathing and have an operculum, which is a calcareous plate that closes the aperture when the snail withdraws into its shell. Pulmonate snails are lung-breathing and do not have an operculum to seal their aperture (Burch 1989).

These animals graze on algae and other microscopic organisms using radular teeth to grind food to an appropriate size for consumption. Snails are an essential part of aquatic ecosystems, as well as indicators of water quality. However, they are typically overlooked. The lack of information and knowledge of snails can be attributed, in part, to their minute size, perceived lack of activity, cryptic habits, and difficulty in identification.

Methods

Snails were surveyed in the Mountain Creek Subbasin and unnamed tributaries to the Pee Dee River within Morrow Mountain State Park (Fig. 1, Introduction Section). Most habitats can be described as riffle/run with slow to medium flow. Pools of different sizes with slow flow were also present. Substrate included combinations of silt, sand, clay, gravel, cobble, boulder, and bedrock. Some aquatic vegetation and organic debris were also present.

Specimens were collected using visual and tactile searches. Due to the cryptic habits of some snail species, it was necessary to sift and dredge the substrate. All available habitats were sampled. Snails were preserved and stored in 70% ethanol.

Snails and limpet snails were identified using Burch (1989) and Basch (1963). Expected distributions and the following characteristics were used to identify the specimens: presence/absence of an operculum, direction of coiling, shell size, shape, color and thickness, texture of the shell, placement of apex, shape and number of the whorls, and the shape of the apertural lip. With the acquisition of additional information, identifications may be subject to change.

Results and Discussion

Snails were located at sixteen of the sites surveyed (Fig. 1). At least seven species representing six families and both subclasses were found within the Mountain Creek Subbasin and unnamed tributaries to the Pee Dee River within Morrow Mountain State Park (Table 1).

During the present survey, *Elimia catenaria* (Say, 1822) and *Elimia proxima* (Say, 1825) were found attached to rocks in the fast current. *Campeloma decisum* (Say, 1816), *Physella* sp., and *Helisoma anceps* (Menke, 1830) were collected in the backwater areas with slow flow in the mud/silt substrate. *Helisoma anceps* was also found in the aquatic vegetation. *Campeloma decisum* is considered a species complex (Adams, pers. comm. 1995). Therefore, when more information is acquired, this species complex may be separated into a few recognizable species.

Amnicola sp. was found on the aquatic vegetation. The limpet snail, *Laevapex fuscus* (C.B. Adams, 1841), was found on the underside of rocks and on woody debris in the slower current.

The Mountain Creek Subbasin and unnamed tributaries to the Pee Dee River within Morrow Mountain State Park support a good abundance and diversity of snails. As is shown in Table 2, most species were found in good numbers at each site.

Resources

- Adams, W. F. (ed). 1990. A Report on the Conservation Status of North Carolina's Freshwater and Terrestrial Molluscan Fauna. The Scientific Council on Freshwater and Terrestrial Mollusks. 246 pp.
- Basch, P. F. 1963. A Review of the Recent Freshwater Limpet Snails of North America (Mollusca: Pulmonata). Bulletin: Museum of Comparative Zoology, Harvard University. 129(8): 399-461.
- Burch, J. B. 1989. *North American Freshwater Snails*. Malacological Publications. Hamburg, MI. 365 pp.

Table 1. Snails found in the waterways of Morrow Mountain State Park

Prosobranchia

Hydrobiidae

Amnicola sp.

Pleuroceridae

Elimia catenaria (Say, 1822)

Gravel elimia

Elimia proxima (Say, 1825)

Sprite elimia

Viviparidae

Campeloma decisum (Say, 1816)

Pointed campeloma

Pulmonata

Physidae

Physella sp.

Planorbidae

Helisoma anceps (Menke, 1830)

Two-ridge rams-horn

Ancylidae

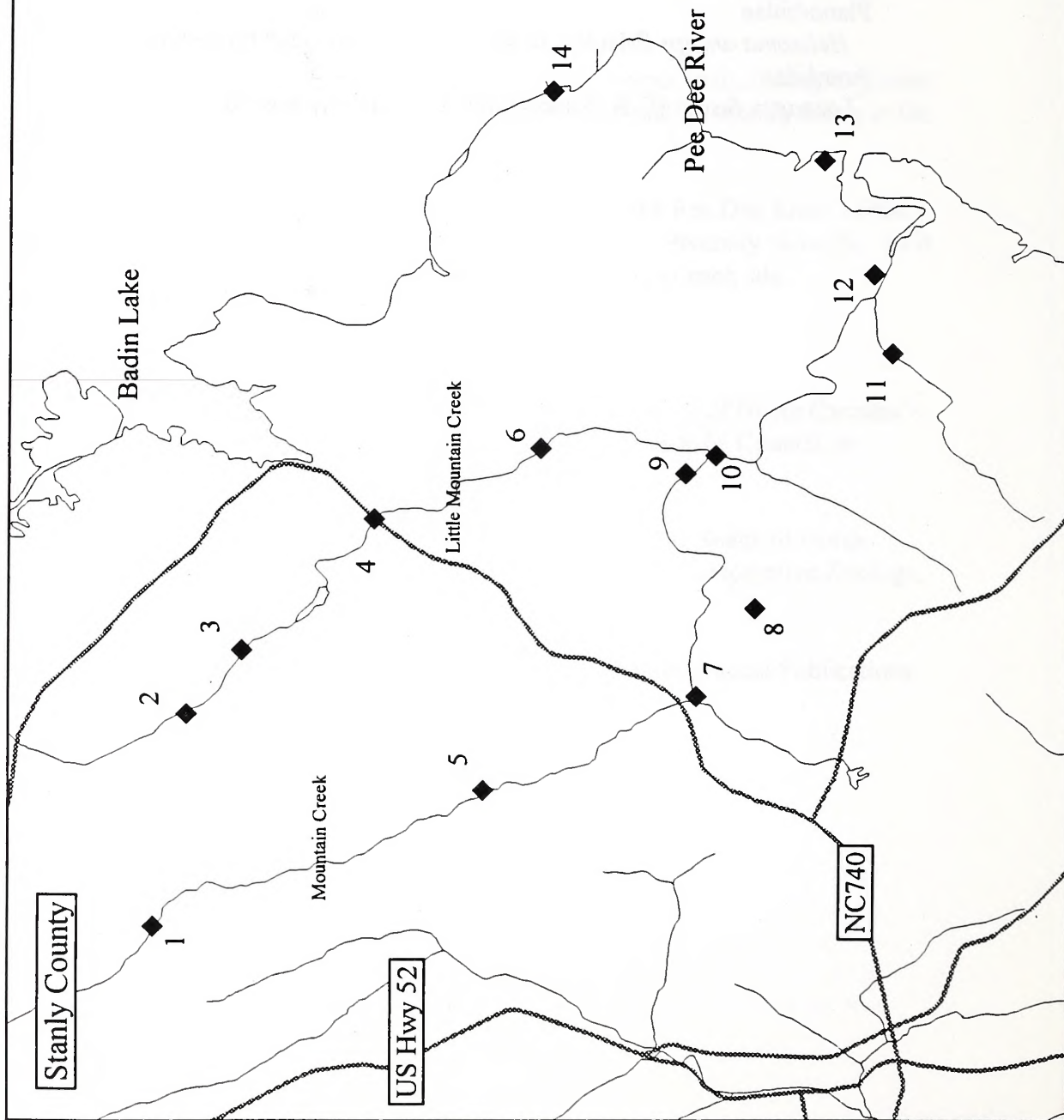
Laevapex fuscus (C.B. Adams, 1841)

Dusky ancylid

MORROW MOUNTAIN STATE PARK

AQUATIC SNAIL SPECIES INVENTORY

Figure 1.



Legend	
Dot No.	Station No.
1	960809.2
2	960822.1
3	960807.1
4	960820.1
5	960820.2
6	950703.2
7	960807.2
8	960809.1
9	960821.3
10	950703.3
11	960808.5
12	950703.5
13	960821.4
14	960821.1
	960808.4
	960808.2

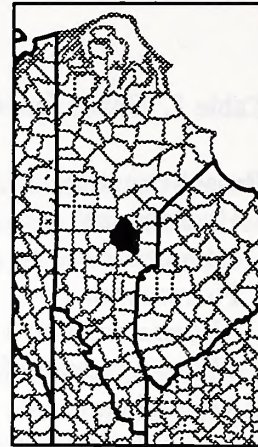


Table 2. Snails found in Morrow Mountain State Park and the Mountain Creek Subbasin

Station No.	Scientific Name	Waterway	Common Locality	County	Date	Number	Identified By
950703.2	<i>Laevapex fuscus</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	3 July 1995	2	G.B. Mottesi
950703.2	<i>Physella sp.</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	3 July 1995	1	G.B. Mottesi
950703.3	<i>Laevapex fuscus</i>	Mountain Creek	SR 1720	Stanly Co., NC	3 July 1995	2	G.B. Mottesi
950703.3	<i>Elimia proxima</i>	Mountain Creek	SR 1720	Stanly Co., NC	3 July 1995	32	G.B. Mottesi
950703.5	<i>Elimia proxima</i>	Mountain Creek	Dnstr. of confl. with L. Mtn. Cr.	Stanly Co., NC	3 July 1995	2	G.B. Mottesi
950703.5	<i>Ammicola sp.</i>	Mountain Creek	Dnstr. of confl. with L. Mtn. Cr.	Stanly Co., NC	3 July 1995	2	G.B. Mottesi
950703.5	<i>Laevapex fuscus</i>	Mountain Creek	Dnstr. of confl. with L. Mtn. Cr.	Stanly Co., NC	3 July 1995	8	G.B. Mottesi
960807.1	<i>Helisoma anceps</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	7 August 1996	6	G.B. Mottesi
960807.1	<i>Laevapex fuscus</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	7 August 1996	3	G.B. Mottesi
960807.1	<i>Physella sp.</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	7 August 1996	5	G.B. Mottesi
960807.2	<i>Laevapex fuscus</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	7 August 1996	13	G.B. Mottesi
960807.2	<i>Physella sp.</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	7 August 1996	7	G.B. Mottesi
960808.2	<i>Physella sp.</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	4	G.B. Mottesi
960808.2	<i>Ammicola sp.</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	1	G.B. Mottesi
960808.2	<i>Helisoma anceps</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	1	G.B. Mottesi
960808.2	<i>Cameloma decisum</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	1	G.B. Mottesi
960808.4	<i>Elimia proxima</i>	unnamed trib. to Pee Dee R.	Family Camp, MMSP	Stanly Co., NC	8 August 1996	12	G.B. Mottesi
960808.5	<i>Laevapex fuscus</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	17	G.B. Mottesi
960808.5	<i>Physella sp.</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	12	G.B. Mottesi
960808.5	<i>Elimia proxima</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	6	G.B. Mottesi
960808.5	<i>Elimia catenaria</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	1	G.B. Mottesi
960809.1	<i>Laevapex fuscus</i>	Mountain Creek	SR 1730	Stanly Co., NC	9 August 1996	7	G.B. Mottesi
960809.2	<i>Elimia proxima</i>	Mountain Creek	SR 1522	Stanly Co., NC	9 August 1996	13	G.B. Mottesi
960809.2	<i>Helisoma anceps</i>	Mountain Creek	SR 1522	Stanly Co., NC	9 August 1996	1	G.B. Mottesi
960809.2	<i>Physella sp.</i>	Mountain Creek	SR 1522	Stanly Co., NC	9 August 1996	5	G.B. Mottesi
960820.1	<i>Physella sp.</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	5	G.B. Mottesi
960820.1	<i>Laevapex fuscus</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	20	G.B. Mottesi
960820.2	<i>Laevapex fuscus</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	2	G.B. Mottesi
960820.2	<i>Helisoma anceps</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	5	G.B. Mottesi
960821.1	<i>Laevapex fuscus</i>	unnamed trib. to Pee Dee R.	Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	12	G.B. Mottesi
960821.1	<i>Helisoma anceps</i>	unnamed trib. to Pee Dee R.	Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	3	G.B. Mottesi
960821.1	<i>Physella sp.</i>	unnamed trib. to Pee Dee R.	Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.1	<i>Ammicola sp.</i>	unnamed trib. to Pee Dee R.	Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	4	G.B. Mottesi
960821.1	<i>Helisoma anceps</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	35	G.B. Mottesi
960821.3	<i>Physella sp.</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	13	G.B. Mottesi
960821.4	<i>Elimia proxima</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	12	G.B. Mottesi
960822.1	<i>Laevapex fuscus</i>	Little Mountain Creek	SR 1545	Stanly Co., NC	22 August 1996	5	G.B. Mottesi

Freshwater Mussels and Sphaeriid Clams

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NC Wildlife Resources Commission

Introduction

Freshwater mussels are in the Class Bivalvia. As the name implies, the mussel is separated into right and left shell-secreting centers. The shell itself is a single entity which is divided into right and left portions. Mussels are characterized by having greatly enlarged gills with ciliated filaments for filter feeding. Freshwater mussels are integral parts of many aquatic ecosystems. They provide nutrients for insects and other invertebrates and are a food source for other organisms. Because they are filter feeders, they are excellent indicators of water quality.

There are approximately 300 species and subspecies of freshwater mussels in the United States. The greatest diversity of these mussels occurs in the Southeast. Roughly 70 species can be found in North Carolina. Unfortunately, approximately half are state listed as Endangered, Threatened, or species of Special Concern (Adams 1990). It appears that the mussel fauna of the United States is in danger of extinction (reference Williams, et al. here). Therefore, it is necessary that we determine the status and distribution of these organisms so that proper management techniques can be applied.

Sphaeriid clams, like freshwater mussels, are in the Class Bivalvia and are filter feeders. The members of this family are considered the pea, pill, nut, or fingernail clams. Because of their well-developed mechanism of passive dispersal and adaptability, sphaeriid clams can be found in almost any body of freshwater. Therefore, their distributions are considered truly cosmopolitan (Branson 1988). In spite of their cosmopolitan distribution, not much is known about sphaeriid clams. They are represented in North America by 38 species of the family Sphaeriidae. In North Carolina, there are approximately 13 species of sphaeriid clams (Adams 1990).

One exotic species, the Asian clam (*Corbicula fluminea* (Müller 1774)), of the family Corbiculidae (Burch 1975) was introduced into this country in 1937 and was found in most of the area surveyed.

Methods

Freshwater mussels and sphaeriid clams were surveyed in the Mountain Creek Subbasin and unnamed tributaries to the Pee Dee River within Morrow Mountain State Park (Fig. 1, Introduction Section). Most habitats can be described as riffle/run with slow to medium flow. Pools of different sizes with slow flow were also present. Substrate included

combinations of silt, sand, clay, gravel, cobble, boulder, and bedrock. Some aquatic vegetation and organic debris were also present.

Freshwater mussels were collected at bridge crossings. Various techniques were used including snorkeling, sifting of the substrate, visual and tactile searches, and visual searches of the shores for shells. Live mussels were identified, measured, and returned unharmed to the appropriate habitat. Fresh shells were identified, measured, and kept for curation.

Sphaeriid clams were also collected at bridge crossings. Collecting techniques included seining, dip netting, sifting of the substrate, and visual and tactile searches. Specimens were preserved and stored in 70% ethanol. Sphaeriid clams were identified using Branson (1988) and Burch (1975). With the acquisition of additional information, identifications made of both freshwater mussels and sphaeriid clams may be subject to change.

Results and Discussion

Figure 1 details the localities of the nine stations where freshwater mussels were found. At least six species of mussels, all in the family Unionidae, were found in the Pee Dee River Basin within Morrow Mountain State Park.

Figure 2 details the locality of the station where sphaeriid clams were found. One species, within the family Sphaeriidae, was found in the Mountain Creek Subbasin.

The specimens falling into either the *Elliptio complanata* or *Elliptio icterina* complexes were listed under the *Elliptio* spp. category. Therefore, these complexes possibly contain several species. The ecophenotypes of these *Elliptio* complexes are found at numerous sites throughout eastern North Carolina (Alderman, pers. comm., 1997). Additional genetic information is necessary to determine the number of species within these complexes.

Fair diversity and abundance of mussels occur within the waterways associated with Morrow Mountain State Park (Table 2). The habitat diversity of the subbasin allows for co-existence of freshwater mussels with varying habitat requirements.

One sphaeriid clam species, *Musculium securis* (Prime, 1852), was found at one site within the survey area (Table 3).

Resources

Adams, W. F. (ed). 1990. A Report on the Conservation Status of North Carolina's Freshwater and Terrestrial Molluscan Fauna. The Scientific Council on Freshwater and Terrestrial Mollusks. 246 pp.

Alderman, J. M. 1997. Personal communication.

- Burch, J. B. 1975. *Freshwater Sphaeriacean Clams (Mollusca: Pelecypoda) of North America*. Museum and Department of Zoology, University of Michigan. Ann Arbor, MI. 96 pp.
- Branson, B. A. 1988. The Sphaeriacean Clams (Mollusca: Bivalvia) of Kentucky. *Transactions of the Kentucky Academy of Science*. 49(1-2): 8-14.
- Johnson, R. I. 1970. *The Systematics and Zoogeography of the Unionidae (Mollusca: Bivalvia) of the Southern Atlantic Slope Region*. Harvard University. Cambridge, MS. 140(6): 263-450.
- Williams, J. D., M. L. Warren, Jr., K. S. Cummings, J. L. Harris, and R. J. Neves. 1992. Conservation Status of Freshwater Mussels of the United States and Canada. American Fisheries Society. Bethesda, MA. *Fisheries* 18(9): 6-22
- Turgeon, D. D., et. al. 1988. *Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks*. American Fisheries Society. Bethesda, MA. 277 + figures pp.

Table 1. Mussels found in the waterways of Morrow Mountain State Park

Unionidae

Elliptio spp.

Lampsilis radiata (Gmelin, 1791)

Pyganodon cataracta (Say, 1817)

Utterbackia imbecilis Say, 1829

Villosa delumbis (Conrad, 1834)

Villosa vaughaniana (I. Lea, 1838)

Eastern lampmussel

Eastern floater

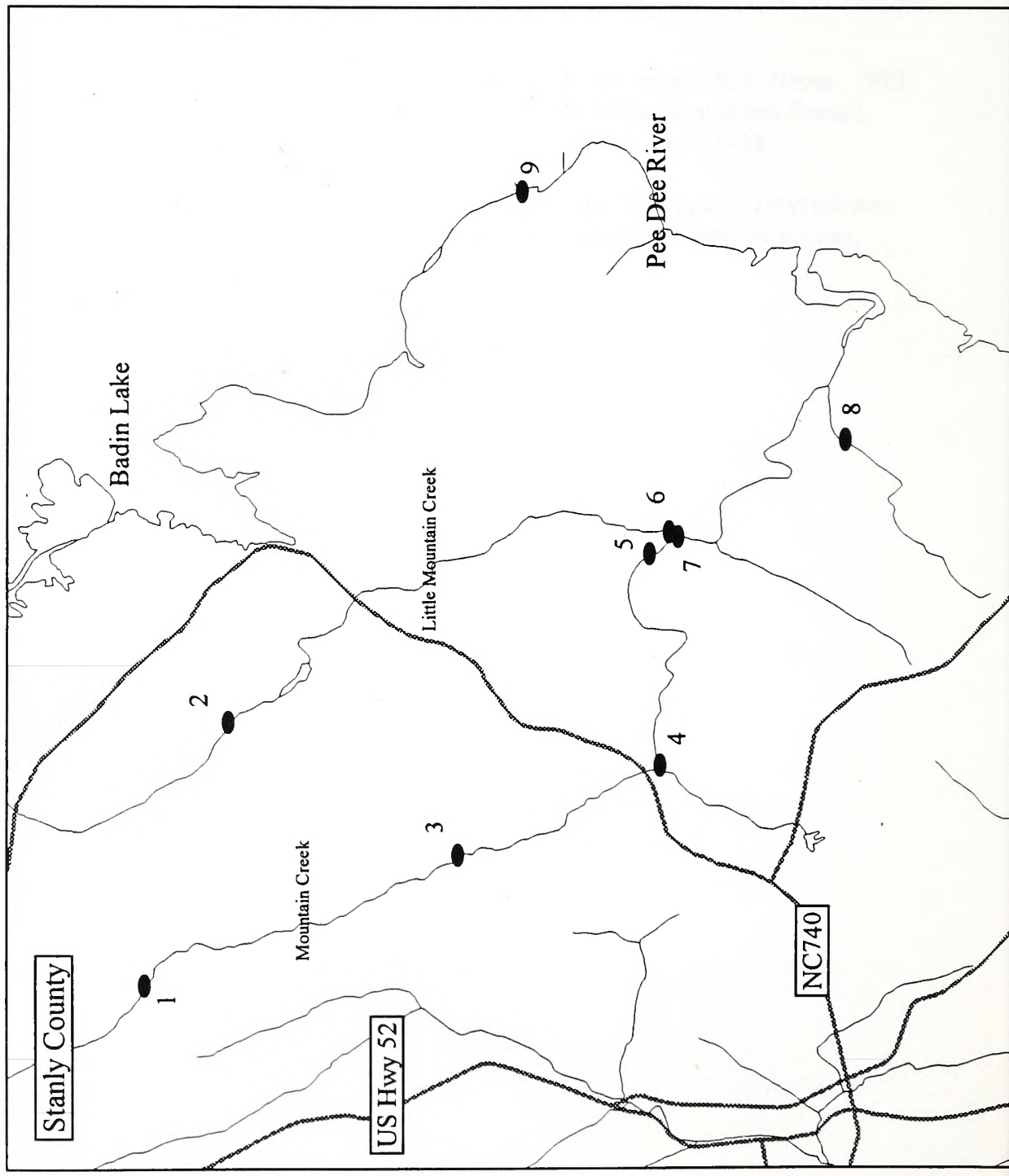
Paper pondshell

Eastern creekshell

Carolina creekshell

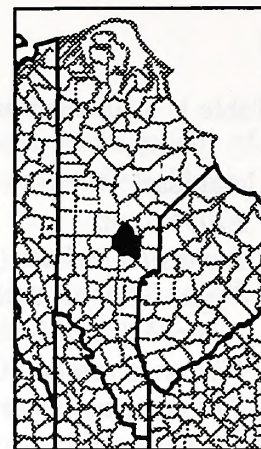
MORROW MOUNTAIN STATE PARK MUSSEL SPECIES INVENTORY

Figure 1.



Legend

Dot No.	Station No.
1	960809.2
2	950703.1
3	960820.2
4	960809.1
5	950703.3
6	950703.4
7	950703.5
8	960821.4
9	960808.2
	960822.2



Miles



Table 2. Mussels found in Morrow Mountain State Park and the Mountain Creek Subbasin

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>Number (live)</u>	<u>Number (shell)</u>
950703.1	<i>Villosa vaughaniana</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	3 July 1995	16	0
950703.3	<i>Elliptio</i> spp.	Mountain Creek	SR 1720	Stanly Co., NC	3 July 1995	5	0
950703.4	<i>Villosa vaughaniana</i>	Little Mountain Creek	Upstr. of confl. with Mountain Cr.	Stanly Co., NC	3 July 1995	1	0
950703.5	<i>Villosa vaughaniana</i>	Mountain Creek	Dnstr. of confl. with Little Mtn. Cr.	Stanly Co., NC	3 July 1995	1	0
960808.2	<i>Utterbackia imbecilis</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	0	1
960808.2	<i>Pygandodon cataracta</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	3	4
960808.2	<i>Lampsilis radiata</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	1	2
960809.1	<i>Elliptio</i> spp.	Mountain Creek	SR 1730	Stanly Co., NC	9 August 1996	0	Present
960809.2	<i>Elliptio</i> spp.	Mountain Creek	SR 1522	Stanly Co., NC	9 August 1996	2	0
960820.2	<i>Elliptio</i> spp.	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	17	3
960821.4	<i>Villosa vaughaniana</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	1	0
960822.2	<i>Lampsilis radiata</i>	Lake Tillery	Boat Ramp, MMSP	Stanly Co., NC	22 August 1996	1	1
960822.2	<i>Utterbackia imbecilis</i>	Lake Tillery	Boat Ramp, MMSP	Stanly Co., NC	22 August 1996	0	1
960822.2	<i>Villosa delumbis</i>	Lake Tillery	Boat Ramp, MMSP	Stanly Co., NC	22 August 1996	0	1

MORROW MOUNTAIN STATE PARK SPHAERIID CLAM SPECIES INVENTORY

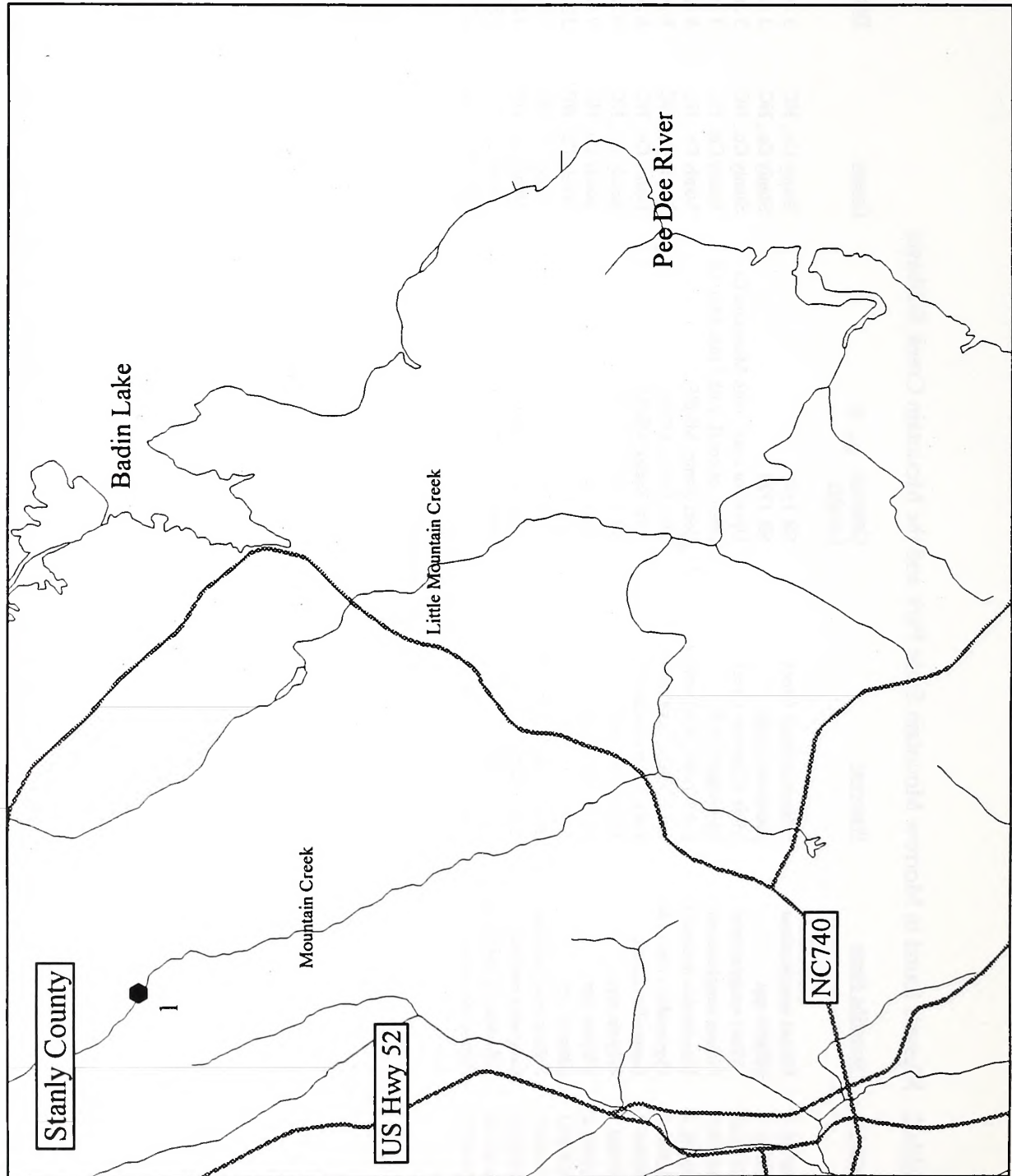


Figure 2.

Legend

<u>Dot No.</u>	<u>Station No.</u>
1	960809.2

Table 3. Sphaeriid clams found in Morrow Mountain State Park and the Mountain Creek Subbasin

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>Number</u>	<u>Identified By</u>
960809.2	<i>Musculium securis</i>	Mountain Creek	SR 1522	Stanly Co., NC	9 August 1996	1	G.B. Mottesi

Crayfish

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NC Wildlife Resources Commission

Introduction

There are currently 338 recognized species of crayfish in the United States and Canada, the greatest diversity of which reside in the Southeast (Taylor et al. 1996). In North Carolina, there are 30 native and 2 introduced species of crayfish (Cooper, pers. comm., 1997). Of these 32 species, nine are listed as significantly rare by the North Carolina Natural Heritage Program (LeGrand and Hall 1995).

Crayfish play a significant role in aquatic ecosystems by representing a large percentage of the biomass in lentic and lotic waters. As prey, they are an important food resource for centrarchids (Rabeni 1992) in addition to birds and mammals (Crocker and Barr 1968). As consumers, they forage for a wide range of nourishment including detritus, aquatic vegetation, arthropods, mollusks, crustaceans, fish, and amphibians (Hobbs III 1993).

Crayfish forage mostly at night and usually seek shelter from predators during daylight hours under cobble and woody debris, in root mats, burrows, or depressions. They are gill breathing organisms and require an aquatic habitat to absorb oxygen from the water. In accordance with habitat preferences, crayfish are classified as either non-burrowers or burrowers. Non-burrowers spend their entire life in the stream bed while burrowers excavate tunnels in roadside ditches, wet pastures, and flood plains (Taylor et al. 1996). Different species of burrowers spend different amounts of their life cycle in subterranean domains.

The average life span of a crayfish is between two and three years (Taylor et al. 1996). During this time, they grow through a series of molts of their exoskeleton. They have five pairs of abdominal appendages called pleopods. The first pleopod pair of the male is modified as a sexual organ. In the family Cambaridae (which includes all North Carolina species), there are two designations for adult male crayfish: Form I and Form II. Throughout their lives, adult males cycle between these forms. Morphologically both forms are similar except in the texture and shape of the first pleopod. Form I males are able to sexually reproduce while Form II males are not. Unlike adult males, adult females do not cycle between morphological forms and once they reach adulthood, they can sexually reproduce.

Although crayfish are common in many freshwater ecosystems, there are significant gaps in our understanding of the distribution, biology and taxonomy of many species. A recent report on the "Conservation Status of Crayfishes of the United States and Canada"

estimated that in the United States and Canada 50% of crayfish species are "in need of conservation recognition" (Taylor et. al. 1996). In North Carolina, researchers are currently investigating the taxonomy and distribution of approximately ten species which are undescribed or belong to species complexes (Cooper, pers. comm., 1997).

This survey focused on North Carolina state park waterways and their surrounding tributaries. Since the emphasis of the project was on the surface water inhabitants, most of the crayfish collected were non-burrowers. Due to time and weather restrictions, the exact distribution of each species within the state park and its associated waterways was not determined. An estimation was made for the relative abundance of each species collected. In addition, specific habitat preferences for each species were noted.

Methods

Crayfish were surveyed in the Mountain Creek Subbasin and unnamed tributaries to the Pee Dee River within Morrow Mountain State Park (Fig. 1). Species were collected with a dipnet and a 6' X 10' mesh net seine. Specimens were preserved and stored in 70% ethanol.

A variety of resources were consulted for identification. "An Illustrated Checklist of the American Crayfishes" (Hobbs 1989) was particularly helpful as well as an unpublished key of North Carolina crayfish (Hobbs 1991). Dr. John Cooper, North Carolina State Museum of Natural Sciences, provided further information used for identification. With additional information, the present identifications may be subject to change.

The key feature used to differentiate crayfish species from one another is the morphology and structure of the first pleopod pair of the Form I male. Form II males, juvenile males, and females can be recognized by their carapace, chelae, rostrum shape, and body coloration.

The carapace is the protective exoskeleton plate which encompasses the anterior half of the crayfish body. Its distinguishing features include the depth/width ratio and the placement of spinose ornamentation. The chelae are enlarged claws on the first pair of legs. Their important characteristics are the shape, which can be long and narrow or round and full, and setae, which are present only in some species. The rostrum refers to the anterior most portion of the carapace and it can be spinose or smooth. In terms of coloration, the exoskeleton can be plain, marbled, or striped with shades of blue, brown, tan, olive, and red.

Specimens were recorded as Form I male (MI), Form II male (MII), juvenile male (jM), adult female (F), and juvenile female (jF). Adult versus juvenile specimens were distinguished based on size. Carapace length was measured from the tip of the rostrum to the posterior carapace edge (Page 1985).

Results

Collections were made from 22 sites on 7 days between 3 July 1995 and 22 August 1996. Crayfish were collected or observed at 16 sites (Table 1). Three species were collected during the survey: *Cambarus (Depressicambarus) reduncus* (Hobbs, 1956), *Cambarus (Puncticambarus) "acuminatus"* (Faxon, 1884), and *Procambarus (Ortmannicus) acutus acutus* (Girard, 1852).

Cambarus (D.) reduncus was collected from the headwaters of Mountain Creek and from a ditch in Morrow Mountain State Park. The Form I male was found dead along a stream bank and the juveniles were collected from shallow pool habitat with leaf litter and cobble substrate. A total of 4 specimens were collected or observed (1 MI, 3 jM). Carapace length ranged from 17.05 to 37.15 mm; mean length was 24.56 (± 8.72) mm. The Form I male was collected on 3 July 1995.

Cambarus (P.) "acuminatus" was commonly associated with cobble substrate in riffle/run habitat. Juveniles were abundant in the small tributaries. Seventy-nine specimens were collected or observed (3 MI, 7 MII, 33 jM, 5 F, 31 jF). Carapace length ranged from 5.80 to 33.10 mm; mean length was 18.70 (± 5.44) mm. Form I males were found on 3 July 1995.

Procambarus (O.) a. acutus was found in pool habitat and among aquatic vegetation. A total of 10 specimens were collected or observed (1 MI, 3 jM, 1 F, 5 jF). Carapace length ranged from 9.60 to 38.65 mm; mean length was 18.20 (± 10.68) mm. The Form I male was collected on 21 August 1996.

Discussion

There is a good abundance of crayfish in the Mountain Creek Subbasin and in the unnamed tributaries to the Pee Dee River in Morrow Mountain State Park. Most sites provided habitat for at least one species of crayfish.

Cambarus (P.) "acuminatus" was abundant throughout the sampled area, and juveniles were especially common in the smaller tributaries. Specimens were collected in all stages of the crayfish life cycle, which supports literature suggesting they are primarily a non-burrowing species and thus spend most of their life in the surface water habitats (Hobbs 1989). The *C. (P.) "acuminatus"* specimens collected from this area are part of a larger species complex, *Cambarus (Puncticambarus) sp. C.* This complex occurs across the Coastal Plain, Piedmont, and Mountain physiographic regions of North Carolina and currently awaits further clarification (Cooper and Braswell 1995).

Procambarus (O.) a. acutus was common throughout the sampled area as well. Juveniles, which represented most of the collected specimens, were found among the aquatic vegetation, while larger specimens occurred in pool habitats. This is consistent with

Hobbs (1989) designation of the habitat type of *P. (O.) a. acutus* as "sluggish to moderately flowing streams and most lentic situations".

Cambarus (D.) reduncus was not common in the sampled waterways. This species is primarily a burrower (Hobbs 1989) which could explain the low numbers found and the prevalence of juvenile specimens.

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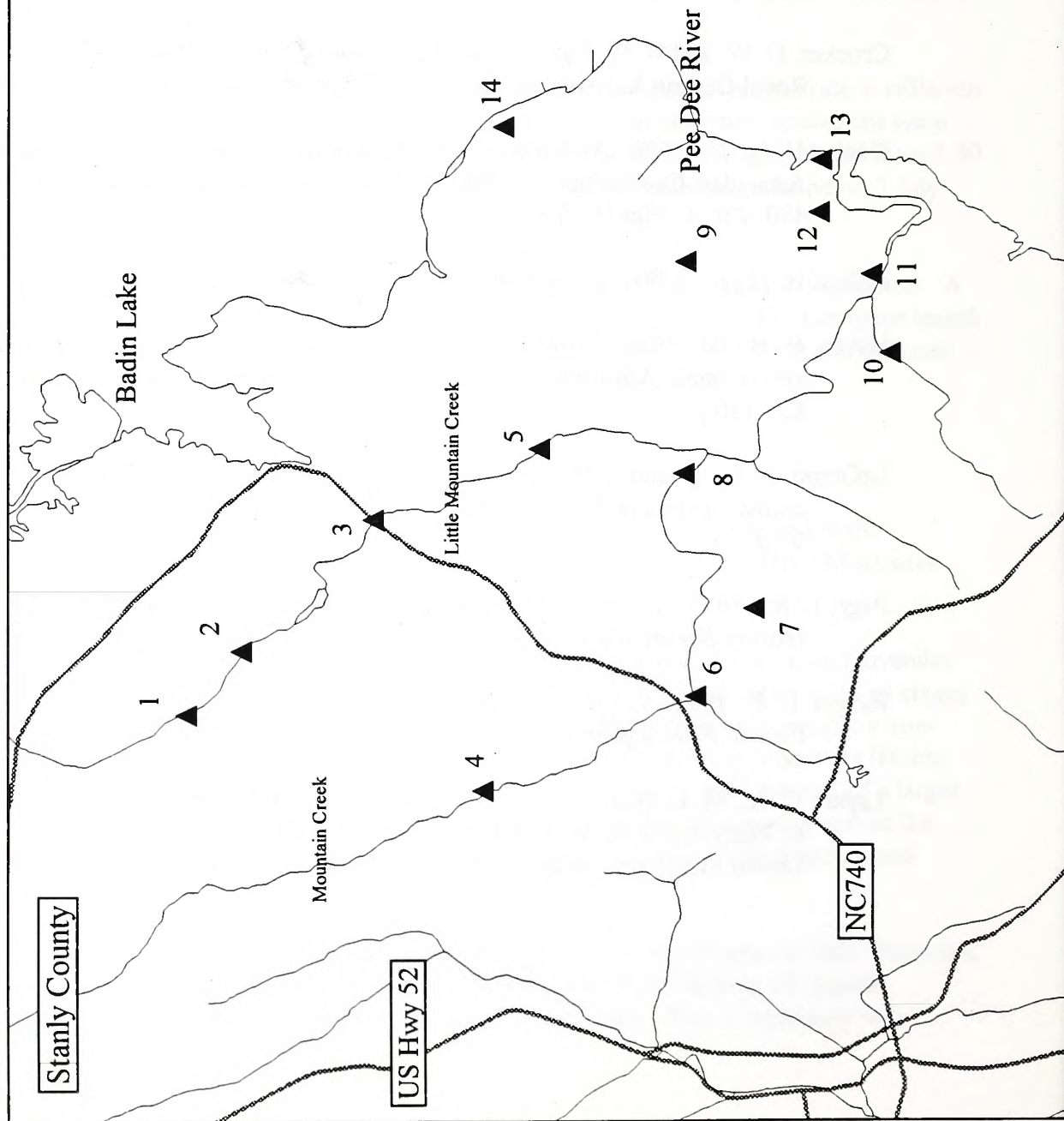
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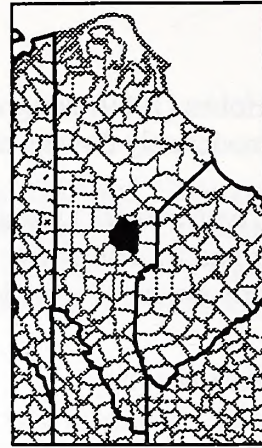
MORROW MOUNTAIN STATE PARK CRAYFISH SPECIES INVENTORY

Figure 1.



Legend

Dot No.	Station No.
1	960822.1
2	950703.1
3	960807.1
4	960820.1
5	960820.2
6	960807.2
7	960809.1
8	960821.3
9	950703.3
10	960808.5
11	960808.1
12	960821.4
13	960821.1
14	960821.2
	960808.4
	960808.3



Miles



Table 1. Crayfish found in Morrow Mountain State Park and the Mountain Creek Subbasin

Station No.	Scientific Name	Waterway	Common Locality	County	Date	Number/Sex	Identified By
950703.1	<i>Cambarus (P.) sp. C</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	3 July 1995	2MI	M.E. Savacool
950703.1	<i>Procambarus (O.) acutus acutus</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	3 July 1995	1F	M.E. Savacool
950703.3	<i>Cambarus (D.) reduncus</i>	Mountain Creek	SR 1720	Stanly Co., NC	3 July 1995	1MI, 1jM	M.E. Savacool
950703.3	<i>Cambarus (P.) sp. C</i>	Mountain Creek	SR 1720	Stanly Co., NC	3 July 1995	1MI, 2MII, 2jM, 1jF	M.E. Savacool
960807.1	<i>Cambarus (P.) sp. C</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	7 August 1996	1F	M.E. Savacool
960807.2	<i>Cambarus (P.) sp. C</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	7 August 1996	3jM, 1F	M.E. Savacool
960808.1	<i>Cambarus (D.) reduncus</i>	roadside ditch	MMSP	Stanly Co., NC	8 August 1996	2jM	M.E. Savacool
960808.1	<i>Cambarus (P.) sp. C</i>	roadside ditch	MMSP	Stanly Co., NC	8 August 1996	1MII, 1jM	M.E. Savacool
960808.3	<i>Cambarus (P.) sp. C</i>	unnamed trib. to Pee Dee R.	Group Camp, MMSP	Stanly Co., NC	8 August 1996	3jM, 1F, 5jF	M.E. Savacool
960808.4	<i>Cambarus (P.) sp. C</i>	unnamed trib. to Pee Dee R.	Family Camp, MMSP	Stanly Co., NC	8 August 1996	2MII, 1jM, 1F	M.E. Savacool
960808.5	<i>Cambarus (P.) sp. C</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	1jM, 1F, 1jF	M.E. Savacool
960809.1	<i>Cambarus (P.) sp. C</i>	Mountain Creek	SR 1730	Stanly Co., NC	9 August 1996	1MII, 4jM, 4jF	M.E. Savacool
960809.1	<i>Procambarus (O.) acutus acutus</i>	Mountain Creek	SR 1730	Stanly Co., NC	9 August 1996	1jM, 2jF	M.E. Savacool
960820.1	<i>Cambarus (P.) sp. C</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	2MII, 4jM, 3jF	M.E. Savacool
960820.2	<i>Cambarus (P.) sp. C</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	1MII, 2jM, 2jF	M.E. Savacool
960821.1	<i>Cambarus (P.) sp. C</i>	unnamed trib. to Pee Dee R.	Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	1jM, 1F, 4jF	M.E. Savacool
960821.1	<i>Procambarus (O.) acutus acutus</i>	unnamed trib. to Pee Dee R.	Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	1MI	M.E. Savacool
960821.2	<i>Cambarus (P.) sp. C</i>	unnamed trib. to Pee Dee R.	Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	3jM, 6jF	M.E. Savacool
960821.3	<i>Procambarus (O.) acutus acutus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	2jM, 3jF	M.E. Savacool
960821.4	<i>Cambarus (P.) sp. C</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	2jM, 1jF	M.E. Savacool
960822.1	<i>Cambarus (P.) sp. C</i>	Little Mountain Creek	SR 1545	Stanly Co., NC	22 August 1996	1MII, 4jM, 2jF	M.E. Savacool

Freshwater Fishes

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Nongame and Endangered Wildlife Program
Division of Wildlife Management
NC Wildlife Resources Commission

Introduction

Approximately 790 fish species are believed to occur in the freshwaters of the United States and Canada (Page & Burr 1991). More than 225 species can be found in North Carolina (Menhinick 1991). This unusually rich and variable fish fauna is due to a great diversity of habitats found within the state and to different zoogeographic distribution patterns of various species. Many game species, several bait and forage species, and at least one aquarium species have become established in North Carolina waters (Menhinick 1991).

Unfortunately, almost one quarter of the fish occurring in North Carolina are state listed as Endangered, Threatened, or Special Concern species. This is of concern since fish are important components of aquatic ecosystems; they are indicators of water quality; and many species are a source of recreation for the state's citizens. Therefore, it is important that we determine their status/distributions and apply proper conservation techniques where necessary.

Methods

Fish were surveyed in the Mountain Creek Subbasin and unnamed tributaries to the Pee Dee River within Morrow Mountain State Park (Fig. 1, Introduction Section). Most habitats can be described as riffle/run with slow to medium flow. Pools of different sizes with slow flow were also present. Substrate included combinations of silt, sand, clay, gravel, cobble, boulder, and bedrock. Some aquatic vegetation and organic debris were also present.

Fish were collected at bridge crossings. Collecting techniques included the use of a 6' x 10' minnow seine, dip nets, and minnow traps. Different techniques of seining, such as kicking, and setting and dragging, were utilized according to the habitat. Specimens were fixed in 10% formalin and preserved in 70% ethanol. Specimens not collected were returned unharmed.

The following sources were used as identification tools: Jenkins (1995), Menhinick (1991), Page (1983), and Page and Burr (1991). Some identifications were verified using specimens from the collection of the NC State Museum of Natural Sciences. With the acquisition of more information, identifications may be subject to change.

Results and Discussion

Figure 1 details the localities of the sixteen stations where fish were found. Twenty-one species of fish representing eight families were found within the waterways associated with Morrow Mountain State Park (Table 1).

The habitat diversity within the Mountain Creek Subbasin and the unnamed tributaries to the Pee Dee River within Morrow Mountain State Park allow for the co-existence of species with different habitat requirements. Species which prefer deeper pool areas, such as: *Lepomis auritus* (Linnaeus, 1758), *Lepomis macrochirus* Rafinesque, 1819, and *Micropterus salmoides* (Lacepède, 1802) were found. *Gambusia holbrooki* Girard, 1859, which is a surface dweller, was detected.

Open water species including: *Notropis altipinnis* (Cope, 1870), *Cyprinella analostana* Girard, 1859, and *Moxostoma anisurum* (Rafinesque, 1820) were also found. These waterways also provided significant leaf litter and woody debris for species such as *Ameiurus natalis* (Lesueur, 1819). Species which prefer shallow pool and/or run habitat such as *Etheostoma olmstedi* Storer, 1842 were also detected. These are just a few examples of the species and habitat diversity found within the waterways associated with Morrow Mountain State Park.

Fish species diversity and abundance are good within the waterways associated with Morrow Mountain State Park (Table 2).

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Table 1. Fish found in the waterways of Morrow Mountain State Park

Clupeidae	
<i>Dorosoma cepedianum</i> (Lesueur, 1818)	Gizzard shad
Esocidae	
<i>Esox niger</i> Lesueur, 1818	Chain pickerel
Cyprinidae	
<i>Clinostomus funduloides</i> Girard, 1856	Rosyside dace
<i>Cyprinella analostana</i> Girard, 1859	Satinfin shiner
<i>Nocomis leptcephalus</i> (Girard, 1856)	Bluehead chub
<i>Notemigonus crysoleucas</i> (Mitchill, 1814)	Golden shiner
<i>Notropis altipinnis</i> (Cope, 1870)	Highfin shiner
<i>Notropis procne</i> (Cope, 1865)	Swallowtail shiner
<i>Semotilus atromaculatus</i> (Mitchill, 1818)	Creek chub
Catostomidae	
<i>Erimyzon oblongus</i> (Mitchill, 1814)	Creek chubsucker
<i>Moxostoma anisurum</i> (Rafinesque, 1820)	Silver redhorse
Ictaluridae	
<i>Ameiurus natalis</i> (Lesueur, 1819)	Yellow bullhead
Poeciliidae	
<i>Gambusia holbrooki</i> Girard, 1859	Eastern mosquitofish
Centrarchidae	
<i>Lepomis auritus</i> (Linnaeus, 1758)	Redbreast sunfish
<i>Lepomis gibbosus</i> (Linnaeus, 1758)	Pumpkinseed sunfish
<i>Lepomis gulosus</i> (Cuvier, 1829)	Warmouth
<i>Lepomis macrochirus</i> Rafinesque, 1819	Bluegill sunfish
<i>Lepomis microlophus</i> (Günther, 1859)	Redear sunfish
<i>Lepomis</i> sp.	
<i>Micropterus salmoides</i> (Lacepède, 1802)	Largemouth bass
Percidae	
<i>Etheostoma olmstedii</i> Storer, 1842	Tessellated darter

MORROW MOUNTAIN STATE PARK

FISH SPECIES INVENTORY

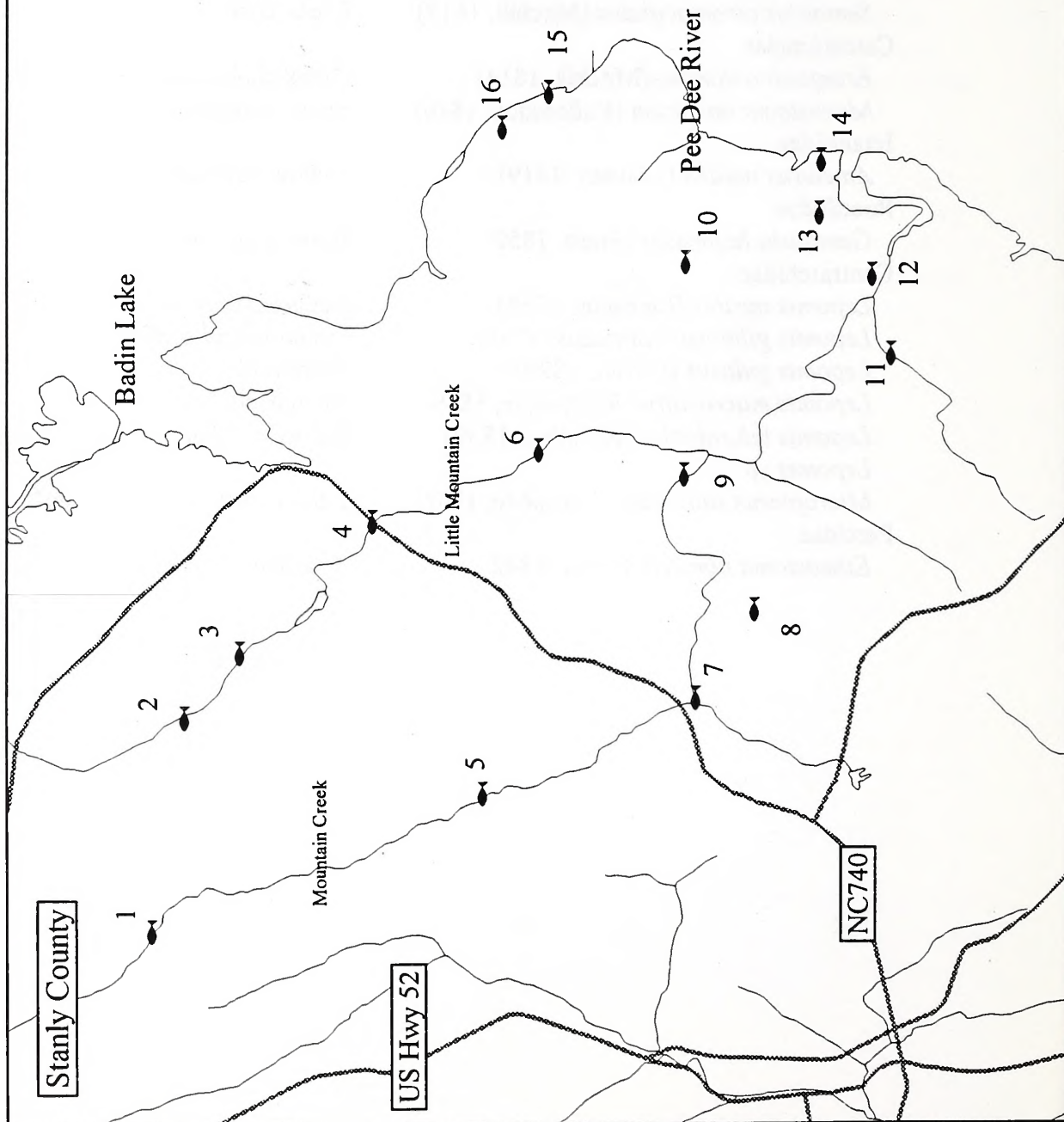


Figure 1.

Dot No.	Station No.
1	960809.2
2	960822.1
3	960807.1
4	960820.1
5	960820.2
6	960807.2
7	960809.1
8	960821.3
9	960808.5
10	960808.1
11	960821.4
12	960821.1
13	960821.2
14	960808.4
15	960808.2
16	960808.3



Miles



Table 2. Fish found in Morrow Mountain State Park and the Mountain Creek Subbasin

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>Number</u>	<u>Identified By</u>
960807.1	<i>Clinostomus funduloides</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	7 August 1996	2	G.B. Mottesi
960807.1	<i>Gambusia holbrooki</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	7 August 1996	1	G.B. Mottesi
960807.1	<i>Semotilus atromaculatus</i>	Little Mountain Creek	SR 1549	Stanly Co., NC	7 August 1996	1	G.B. Mottesi
960807.2	<i>Lepomis auritus</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	7 August 1996	3	G.B. Mottesi
960807.2	<i>Lepomis gibbosus</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	7 August 1996	2	G.B. Mottesi
960807.2	<i>Lepomis macrochirus</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	7 August 1996	3	G.B. Mottesi
960807.2	<i>Nocomis leptoccephalus</i>	Little Mountain Creek	SR 1720	Stanly Co., NC	7 August 1996	13	G.B. Mottesi
960808.1	<i>Semotilus atromaculatus</i>	roadside ditch	MMSP	Stanly Co., NC	8 August 1996	5	G.B. Mottesi
960808.1	<i>Clinostomus funduloides</i>	roadside ditch	MMSP	Stanly Co., NC	8 August 1996	5	G.B. Mottesi
960808.2	<i>Cyprinella analostana</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	9	G.B. Mottesi
960808.2	<i>Etheostoma olmstedi</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	3	G.B. Mottesi
960808.2	<i>Gambusia holbrooki</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	3	M.E. Savacool
960808.2	<i>Lepomis auritus</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	1	G.B. Mottesi
960808.2	<i>Lepomis macrochirus</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	2	G.B. Mottesi
960808.2	<i>Micropterus salmoides</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	2	G.B. Mottesi
960808.2	<i>Notropis proce</i>	Lake Tillery backwaters	Boat Ramp, MMSP	Stanly Co., NC	8 August 1996	12	G.B. Mottesi
960808.3	<i>Nocomis leptoccephalus</i>	unnamed trib. to Pee Dee R.	Group Camp, MMSP	Stanly Co., NC	8 August 1996	1	G.B. Mottesi
960808.3	<i>Semotilus atromaculatus</i>	unnamed trib. to Pee Dee R.	Group Camp, MMSP	Stanly Co., NC	8 August 1996	4	G.B. Mottesi
960808.3	<i>Clinostomus funduloides</i>	unnamed trib. to Pee Dee R.	Group Camp, MMSP	Stanly Co., NC	8 August 1996	9	G.B. Mottesi
960808.4	<i>Clinostomus funduloides</i>	unnamed trib. to Pee Dee R.	Family Camp, MMSP	Stanly Co., NC	8 August 1996	2	G.B. Mottesi
960808.4	<i>Semotilus atromaculatus</i>	unnamed trib. to Pee Dee R.	Family Camp, MMSP	Stanly Co., NC	8 August 1996	2	G.B. Mottesi
960808.5	<i>Clinostomus funduloides</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	9	G.B. Mottesi
960808.5	<i>Etheostoma olmstedi</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	3	G.B. Mottesi
960808.5	<i>Lepomis auritus</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	2	G.B. Mottesi
960808.5	<i>Lepomis macrochirus</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	3	G.B. Mottesi
960808.5	<i>Micropterus salmoides</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	2	G.B. Mottesi
960808.5	<i>Nocomis leptoccephalus</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	3	G.B. Mottesi
960809.1	<i>Nocomis leptoccephalus</i>	Mountain Creek	SR 1720	Stanly Co., NC	8 August 1996	1	G.B. Mottesi
960809.1	<i>Semotilus atromaculatus</i>	Mountain Creek	SR 1730	Stanly Co., NC	8 August 1996	10	G.B. Mottesi
960809.1	<i>Notropis altipinnis</i>	Mountain Creek	SR 1730	Stanly Co., NC	9 August 1996	16	G.B. Mottesi
960809.1	<i>Clinostomus funduloides</i>	Mountain Creek	SR 1730	Stanly Co., NC	9 August 1996	1	G.B. Mottesi
960809.1	<i>Etheostoma olmstedi</i>	Mountain Creek	SR 1730	Stanly Co., NC	9 August 1996	1	G.B. Mottesi
960809.1	<i>Erimyzon oblongus</i>	Mountain Creek	SR 1730	Stanly Co., NC	9 August 1996	9	G.B. Mottesi
960809.2	<i>Lepomis microlophus</i>	Mountain Creek	SR 1522	Stanly Co., NC	9 August 1996	11	G.B. Mottesi
960820.1	<i>Notemigonus crysoleucas</i>	Mountain Creek	SR 740	Stanly Co., NC	9 August 1996	1	G.B. Mottesi
960820.1	<i>Ameiurus natalis</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	2	G.B. Mottesi
960820.1		Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	3	G.B. Mottesi

Table 2. Fish found in Morrow Mountain State Park and the Mountain Creek Subbasin (cont.)

Station No.	Scientific Name	Waterway	Common Locality	County	Date	Number	Identified By
960820.1	<i>Esox niger</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	1	G.B. Mottesi
960820.1	<i>Notropis chiliticus</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	5	G.B. Mottesi
960820.1	<i>Lepomis auritus</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	1	G.B. Mottesi
960820.1	<i>Lepomis gibbosus</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	1	G.B. Mottesi
960820.1	<i>Lepomis gulosus</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	2	G.B. Mottesi
960820.1	<i>Lepomis macrochirus</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	3	G.B. Mottesi
960820.1	<i>Nocomis leptoccephalus</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	2	G.B. Mottesi
960820.1	<i>Semotilus atromaculatus</i>	Little Mountain Creek	NC 740	Stanly Co., NC	20 August 1996	1	G.B. Mottesi
960820.2	<i>Clinostomus funduloides</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	1	G.B. Mottesi
960820.2	<i>Etheostoma olmstedi</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	7	G.B. Mottesi
960820.2	<i>Gambusia holbrooki</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	2	G.B. Mottesi
960820.2	<i>Lepomis auritus</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	1	G.B. Mottesi
960820.2	<i>Lepomis gibbosus</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	2	G.B. Mottesi
960820.2	<i>Lepomis macrochirus</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	1	G.B. Mottesi
960820.2	<i>Nocomis leptoccephalus</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	7	G.B. Mottesi
960820.2	<i>Notropis alipinnis</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	4	G.B. Mottesi
960820.2	<i>Notropis chiliticus</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	2	G.B. Mottesi
960820.2	<i>Semotilus atromaculatus</i>	Mountain Creek	SR 1542	Stanly Co., NC	20 August 1996	1	G.B. Mottesi
960821.1	<i>Clinostomus funduloides</i>	unnamed trib. to Pee Dee R.	Off Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	2	G.B. Mottesi
960821.1	<i>Etheostoma olmstedi</i>	unnamed trib. to Pee Dee R.	Off Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	8	G.B. Mottesi
960821.1	<i>Lepomis auritus</i>	unnamed trib. to Pee Dee R.	Off Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.1	<i>Lepomis macrochirus</i>	unnamed trib. to Pee Dee R.	Off Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	2	G.B. Mottesi
960821.1	<i>Moxostoma anisurum</i>	unnamed trib. to Pee Dee R.	Off Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.1	<i>Nocomis leptoccephalus</i>	unnamed trib. to Pee Dee R.	Off Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	4	G.B. Mottesi
960821.1	<i>Notropis chiliticus</i>	unnamed trib. to Pee Dee R.	Off Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	4	G.B. Mottesi
960821.2	<i>Semotilus atromaculatus</i>	unnamed trib. to Pee Dee R.	Off Bridle Trail, MMSP	Stanly Co., NC	21 August 1996	11	G.B. Mottesi
960821.3	<i>Lepomis sp.</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.3	<i>Semotilus atromaculatus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.3	<i>Lepomis macrochirus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.3	<i>Lepomis gibbosus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	2	G.B. Mottesi
960821.3	<i>Lepomis auritus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.3	<i>Gambusia holbrooki</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	3	G.B. Mottesi
960821.4	<i>Clinostomus funduloides</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	3	G.B. Mottesi
960821.4	<i>Dorosoma cepedianum</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	4	G.B. Mottesi
960821.4	<i>Lepomis auritus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.4	<i>Lepomis macrochirus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	2	G.B. Mottesi

Table 2. Fish found in Morrow Mountain State Park and the Mountain Creek Subbasin (cont.)

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>Number</u>	<u>Identified By</u>
960821.4	<i>Micropterus salmoides</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	2	G.B. Mottesi
960821.4	<i>Notropis chiliticus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960821.4	<i>Semotilus atromaculatus</i>	unnamed trib. to Mountain Cr.	SR 1730	Stanly Co., NC	21 August 1996	1	G.B. Mottesi
960822.1	<i>Semotilus atromaculatus</i>	Little Mountain Creek	SR 1545	Stanly Co., NC	22 August 1996	9	G.B. Mottesi
960822.1	<i>Nocomis leptocephalus</i>	Little Mountain Creek	SR 1545	Stanly Co., NC	22 August 1996	13	G.B. Mottesi
960822.1	<i>Gambusia holbrooki</i>	Little Mountain Creek	SR 1545	Stanly Co., NC	22 August 1996	2	G.B. Mottesi
960822.1	<i>Clinostomus funduloides</i>	Little Mountain Creek	SR 1545	Stanly Co., NC	22 August 1996	8	G.B. Mottesi

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